

A Data Model for University-based Traffic Safety Research

29th International
Forum on Traffic
Records

July 13 - 17, 2003

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Overview

- Introduction
- Extent of Research
- Key Components
- Character of Safety Activities

Introduction

- CTRE is the focal point for transportation at Iowa State University.
- Traffic safety activities include
 - Applied Research
 - Software development/deployment
 - Education
 - Crash data mining and presentation

Extent of Research

- Begins with crash data collection.
- Ranges from site specific to system wide.
- Can be qualitative in nature.
- Encompasses multiple disciplines.

Key Components

- Rich, Statewide Crash and Roadway Databases
 - GIS-based
 - All public roads
 - 10 years (crashes)
 - ~100 attributes (crashes)
- Analysis Tools
- Multidisciplinary and interagency cooperation.

Character of Safety Activities

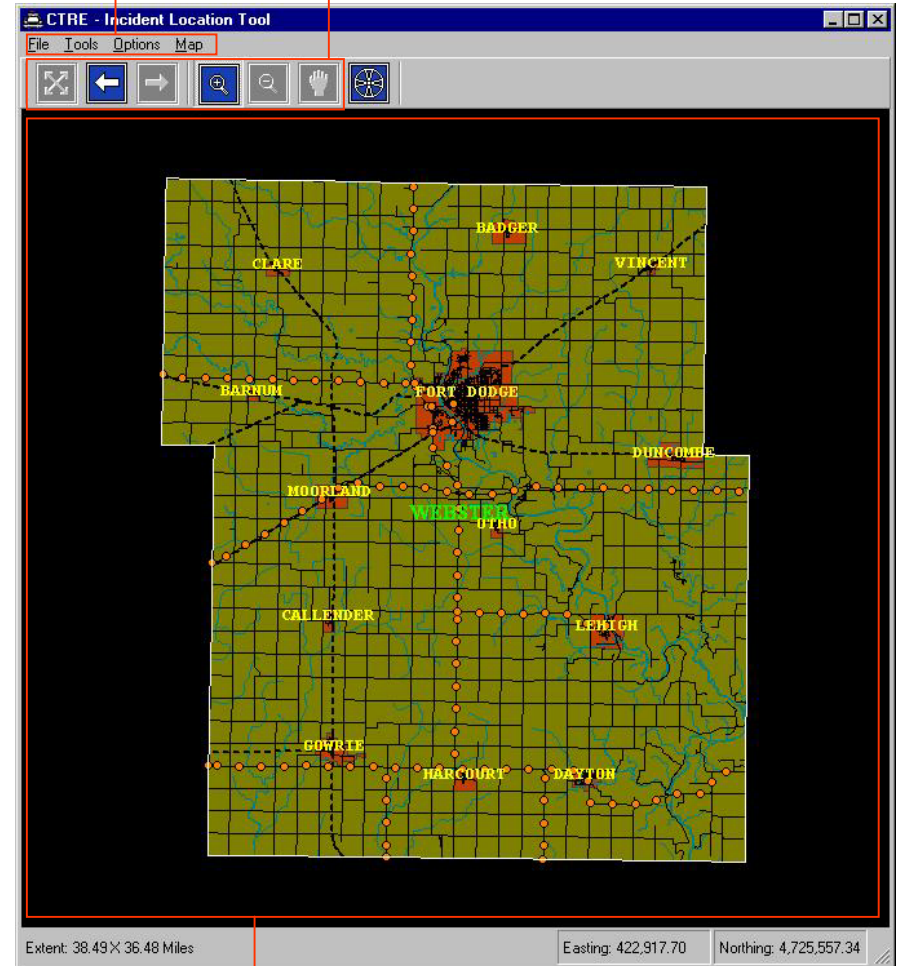
- Crash Data Collection & Sketch-level Analyses
- Best Practices & Policy Assessment
- High Crash Location Identification & Ranking
- Project & Site Review
- Targeted Enforcement

Crash Data Collection

- Incident Location Tool
- GIS-based
- ~220 agencies
 - ~50% Crashes
- Drivers Services
 - Remaining 50%
- TraCS Utility, used by several states
- Improved crash locations, resulting in improved analyses.

Command Menus

Map Manipulation Buttons

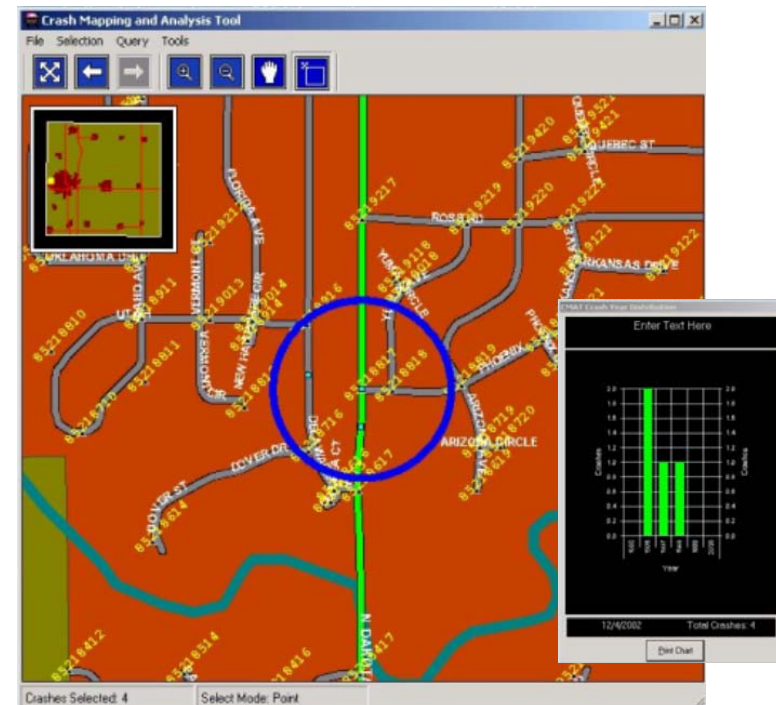
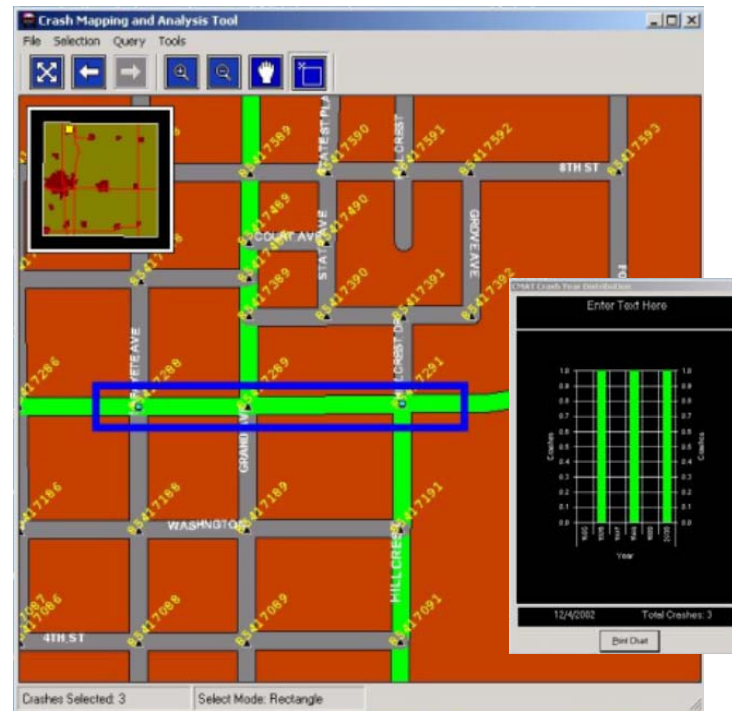


Map Window

Incident Location Tool – Graphic User Interface

Sketch-level Analysis

- Incident Management & Analysis Tool (IMAT)
- GIS-based
- Designed for novice users & simple spatial analyses
- FREE from Iowa DOT, incl. training
- Facilitates quick and easy frequency-based analyses for **all** user levels.

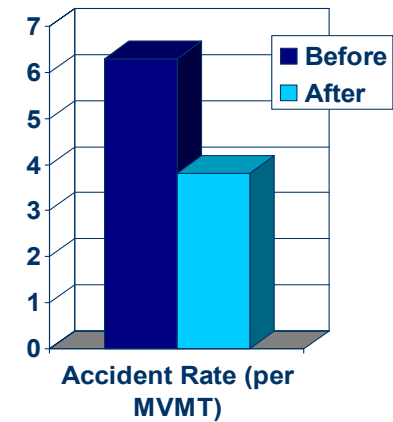
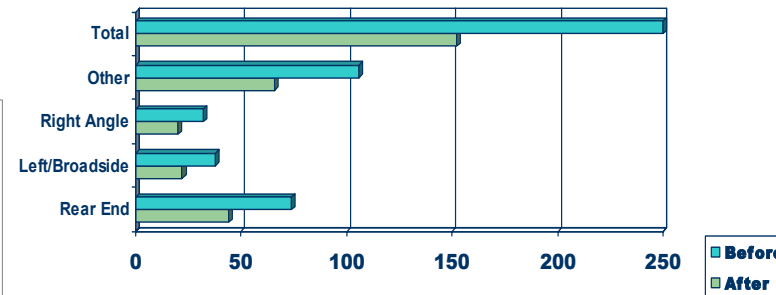
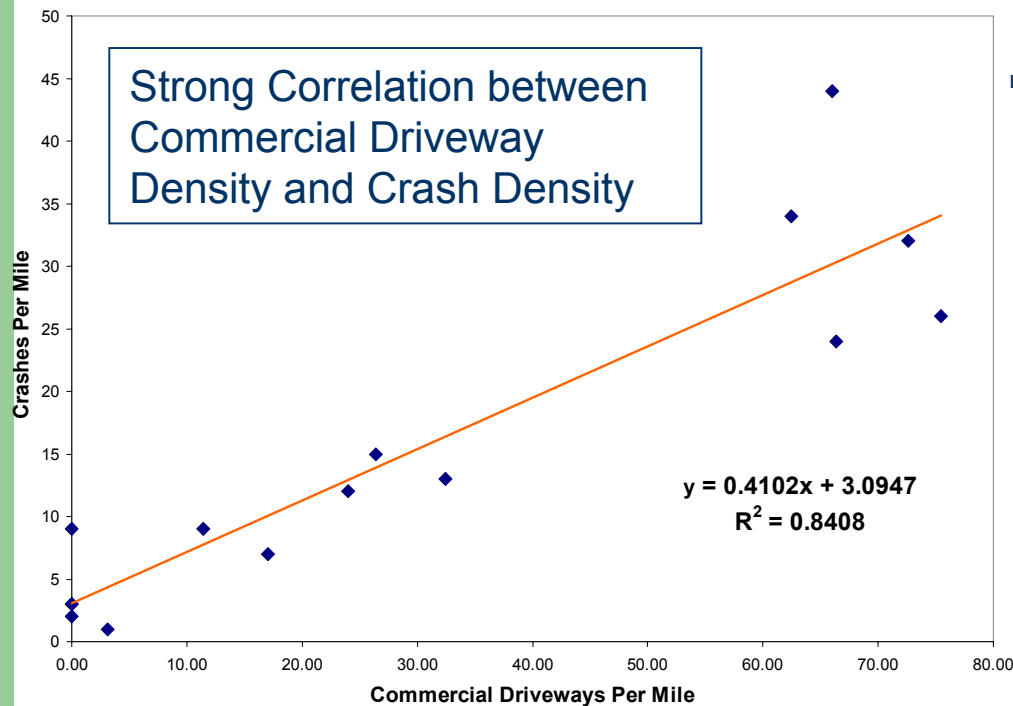


Best Practices Assessment

- Evaluate the possible safety-related impacts of different policies and practices (design, traffic control, and maintenance).
 - Quantify the magnitude of a problem.
 - Investigate differences in crash history.
 - Develop guidelines and recommendations.

Access Management

Crashes Versus Commercial Driveways



40% Ave Reduction in Crash Rates after Access Management

Access Management

Good Management



Poor Management

There is a strong correlation between access density and broadside collisions



Courtesy of Dave Plazak, CTRE

Red Light Running

- Scope, Impact, and Possible Implications

Table 2 Summary of Costs Linked to Ran-Traffic-Signal Crashes (1996–1998)

Jurisdiction	Fatalities	Injuries*	PDO**	Total Crashes	Total Costs
Bettendorf	0	86	68	129	\$1,691,487
Davenport	1	583	279	637	\$11,752,603
Dubuque	0	202	65	190	\$3,115,509
Fort Dodge	0	84	62	122	\$1,198,732
Iowa City	0	150	125	235	\$2,364,738
Sioux City	1	322	146	335	\$5,369,499
West Des Moines	0	126	70	154	\$1,196,000
State of Iowa	12	5,881	3,435	7,138	\$110,428,000

* Total injuries.

** Number of property damage only crashes; some jurisdictions do not report all PDO crashes.

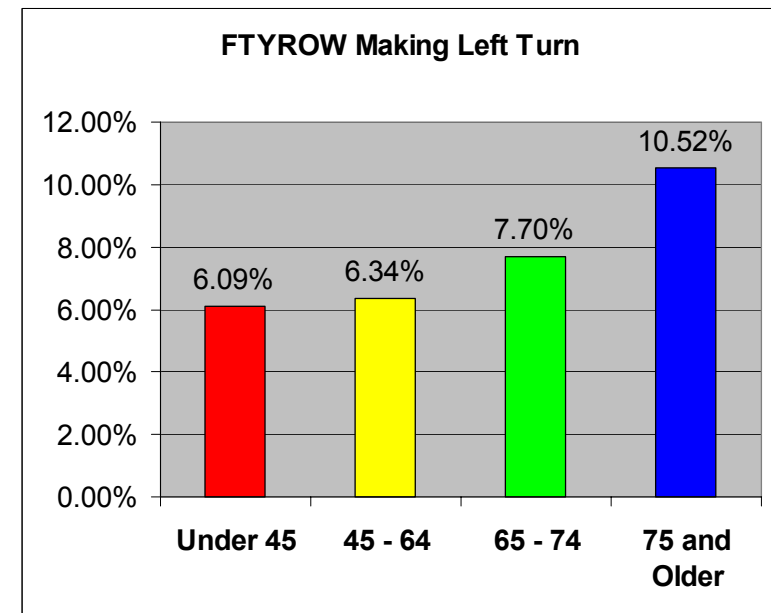
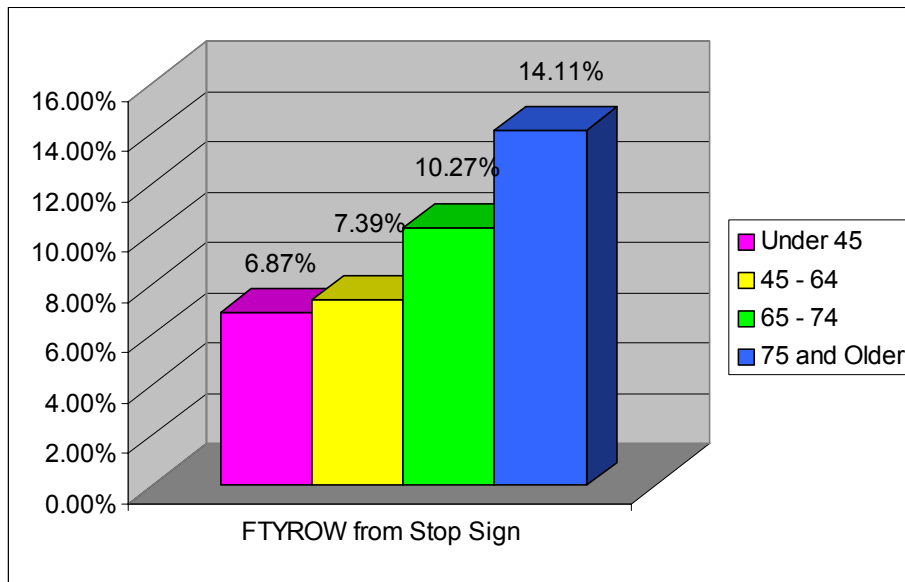
Angle Parking

- ...on Iowa's Low Volume Primary Extensions in Small Towns
- Findings: No compelling justification for blanket prohibition

Parking Type	Sites	Rate (HVMVT)	Rate (MEV)
Diagonal, Both	72	900	0.6
Parallel , Both	26	600	0.5
Diagonal, One	4	1000	0.8
Parallel & Diag	19	600	0.4
None	14	800	0.6

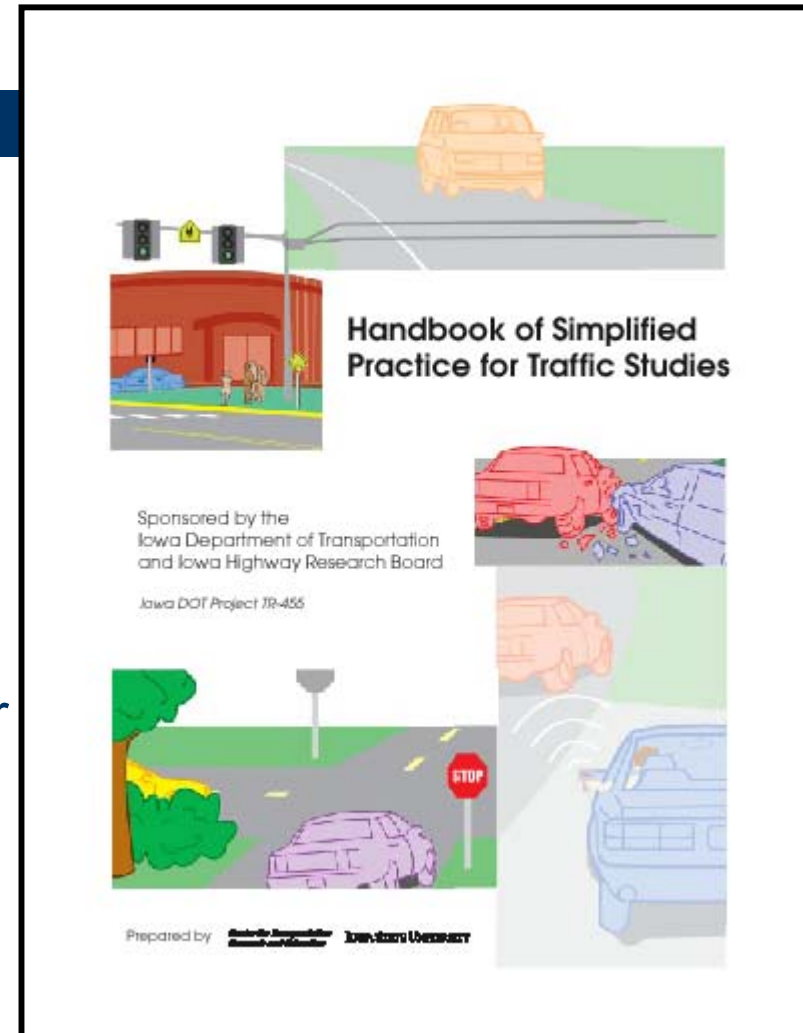
Accommodating Older Drivers

- Assessing Older Driver Mobility Issues



Development of Guidelines

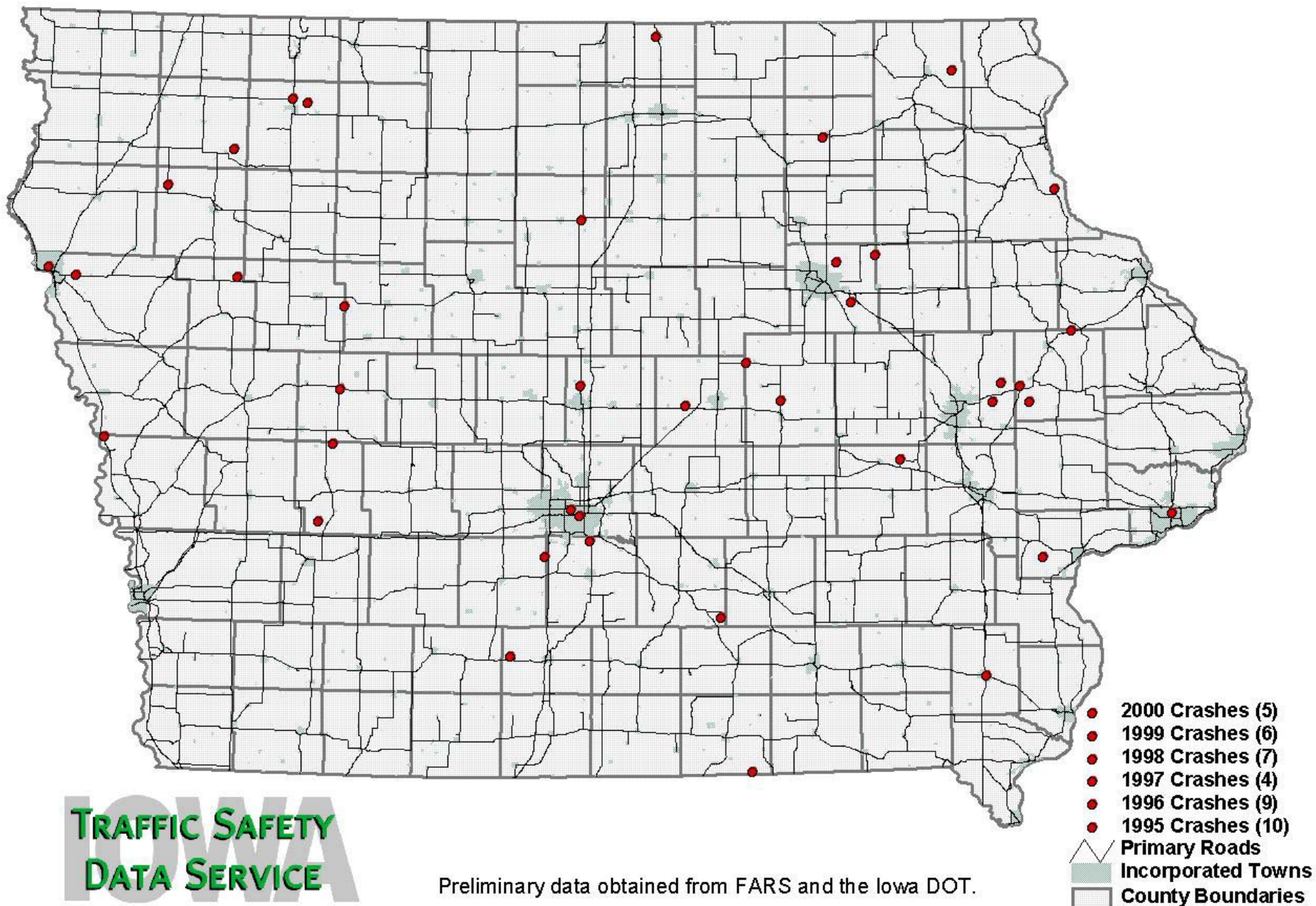
- Handbook of Simplified Practice for Traffic Studies →
- Traffic Control Strategies in Work Zones with Edge Dropoffs
- Traffic Control Devices and Pavement Markings: A Manual for Cities and Counties



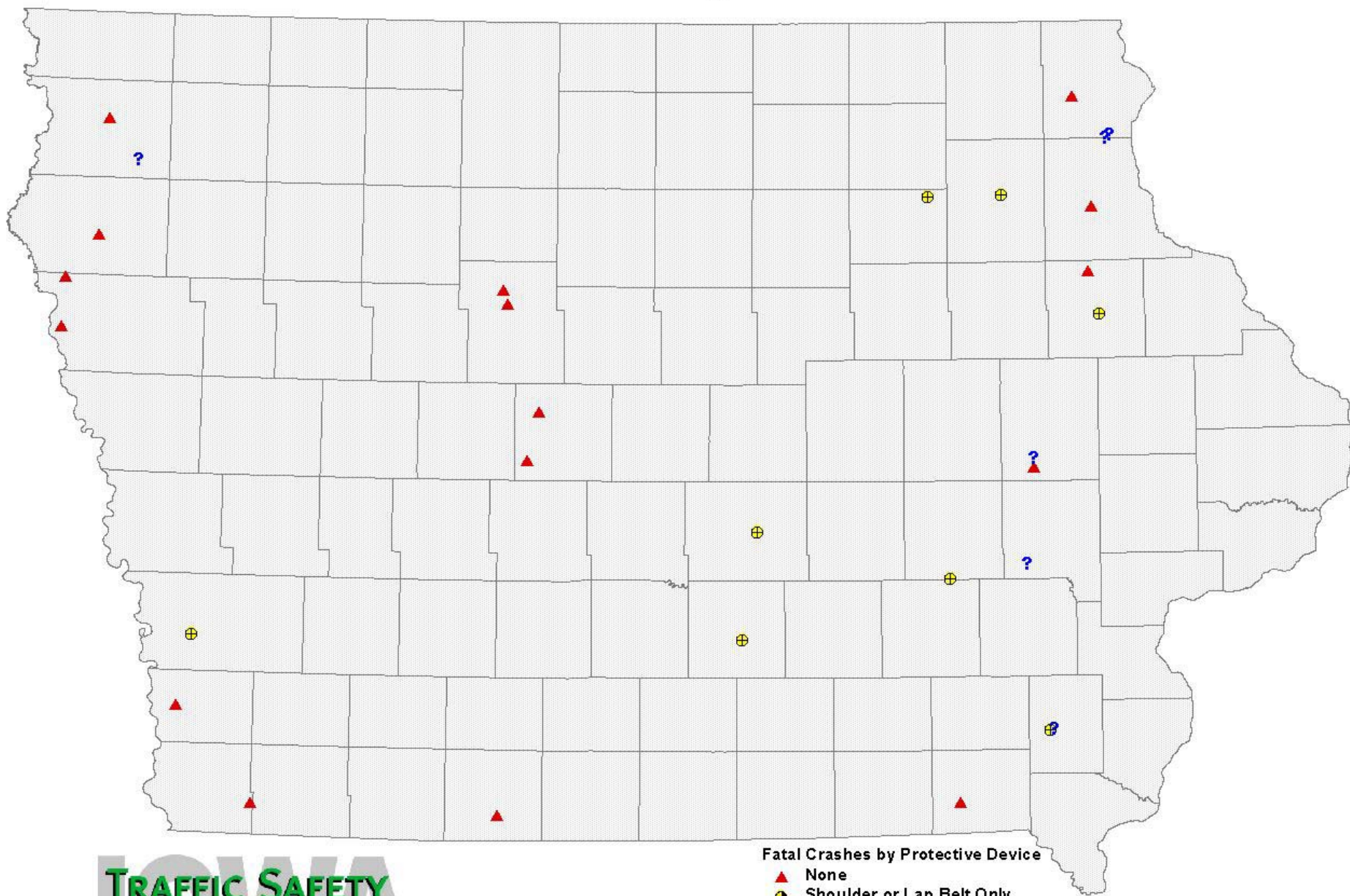
Policy Assessment

- Evaluate the possible safety-related impacts of different policies or legislative mandates, such as...
 - Blood Alcohol Content (BAC) – 0.08 v. 0.10
 - In-vehicle restraint requirements – Age, Seating Position

1995-2000 Fatal Crashes in Iowa Involving Driver BAC of .08 or .09



1997 - 2000 Fatal Crashes Involving Children 14 or 15 Years Old



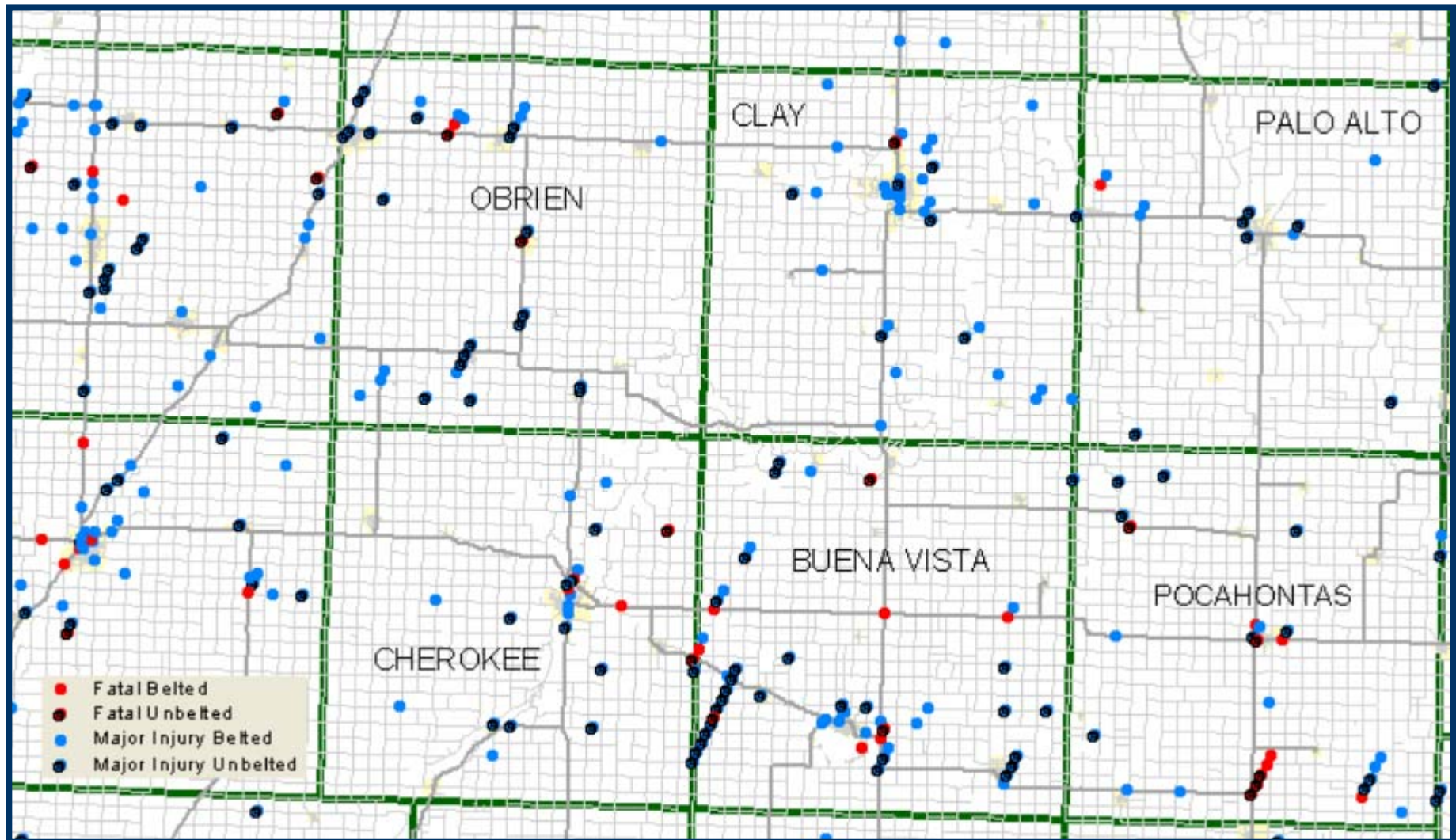
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Fatal Crashes by Protective Device

- ▲ None
- ⊕ Shoulder or Lap Belt Only
- ⊕ Shoulder and Lap Belt
- Child Safety Seat
- ? Unknown
- County Borders

Note: One Fatality Unlocated

BELT USE			Driver	Front Seat Middle	Front Seat Passenger Side	Rear Seat Driver Side	Rear Seat Middle	Rear Seat Passenge r Side	Third Seat Driver Side	Third Seat Middle	Third Seat Passenger Side	Subtotal	TOTAL	GRAND TOTAL
1997 to 1999	Fatal	unbelted	345	8	103	16	9	16	12	4	9	522	937	6408
		belted	296	1	103	6	0	4	2	1	2	415		
	Major Injury	unbelted	1227	50	473	95	56	91	40	26	32	2090	5471	
		belted	2427	21	780	60	20	34	16	7	16	3381		



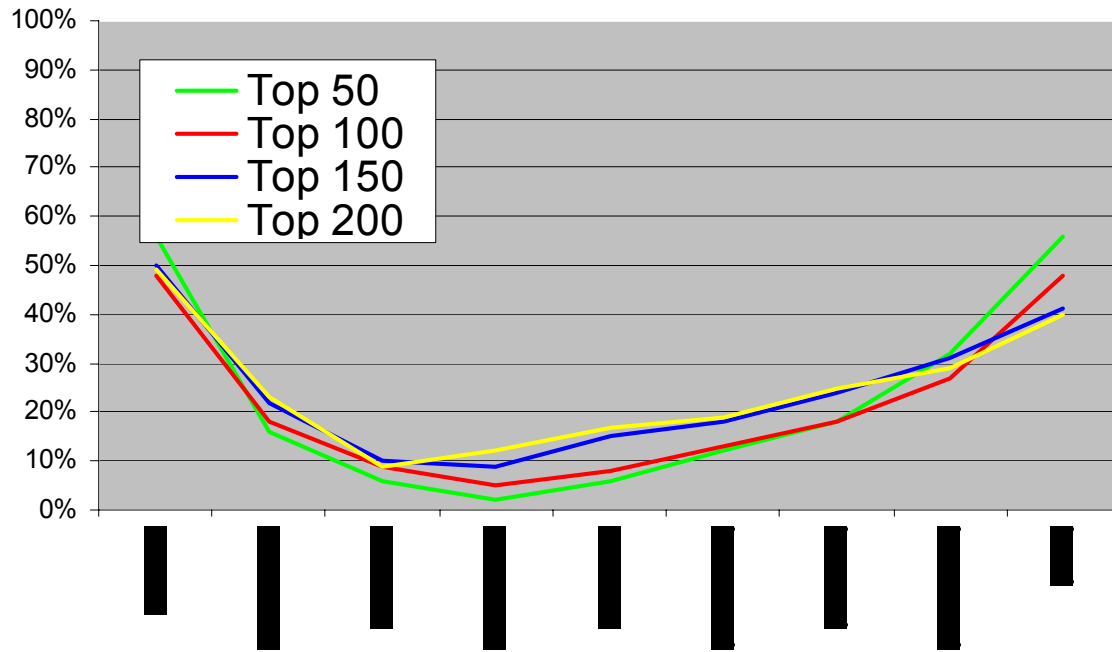
High Crash Location Identification and Ranking

- What qualifies as a high crash location?
- How should locations be compared?
- Identification of high crash locations, given certain criteria

High Crash Location Ranking

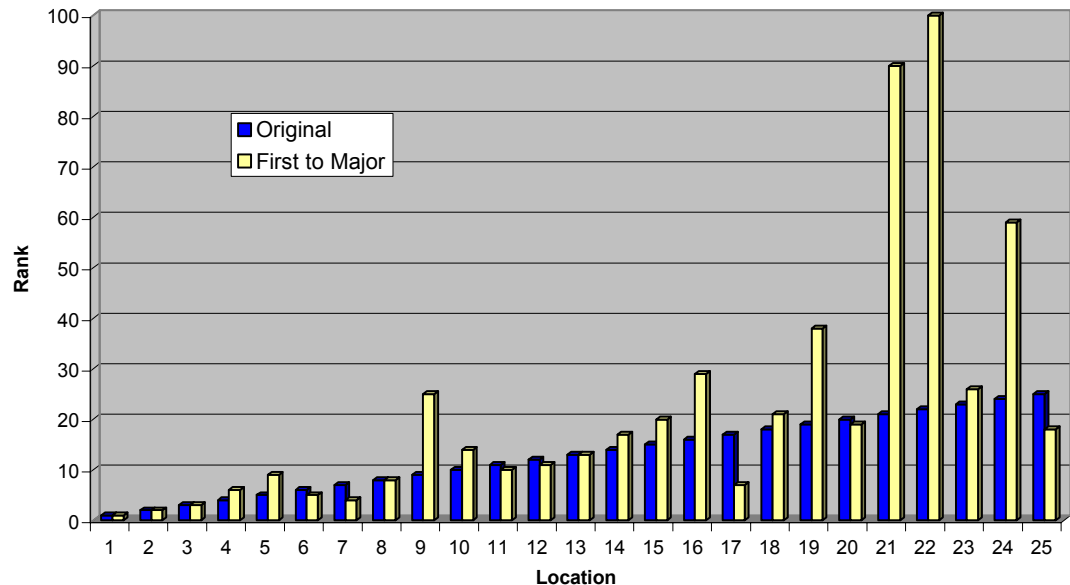
- Evaluation of the Iowa DOT's Safety Improvement Candidate List Process
 - Impact of fatalities on ranking
 - Influence of different weighting frequency, rate, value loss on ranking
 - Develop a new weighting system

Safety Candidate Site Evaluation



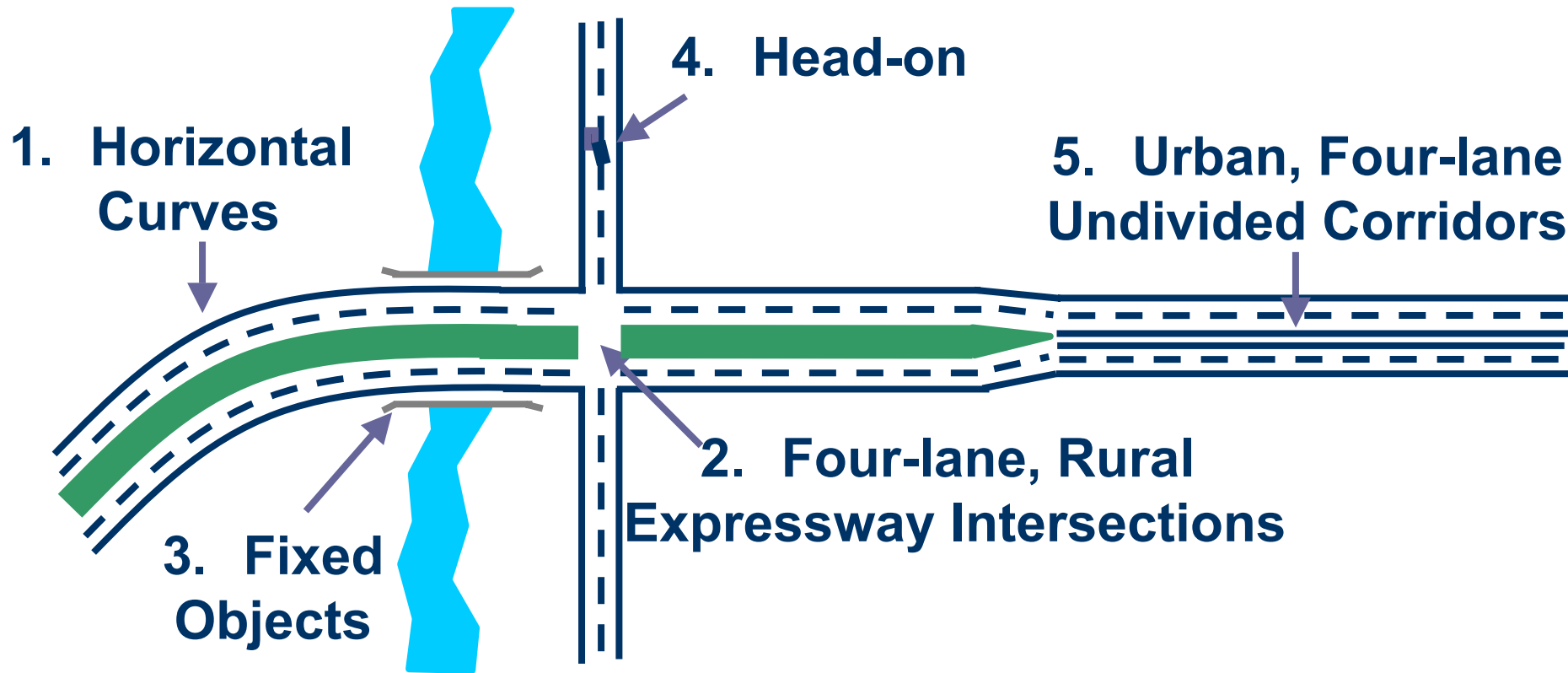
Number of Locations Dropped When Crash Frequency Varied

Impact on Ranking

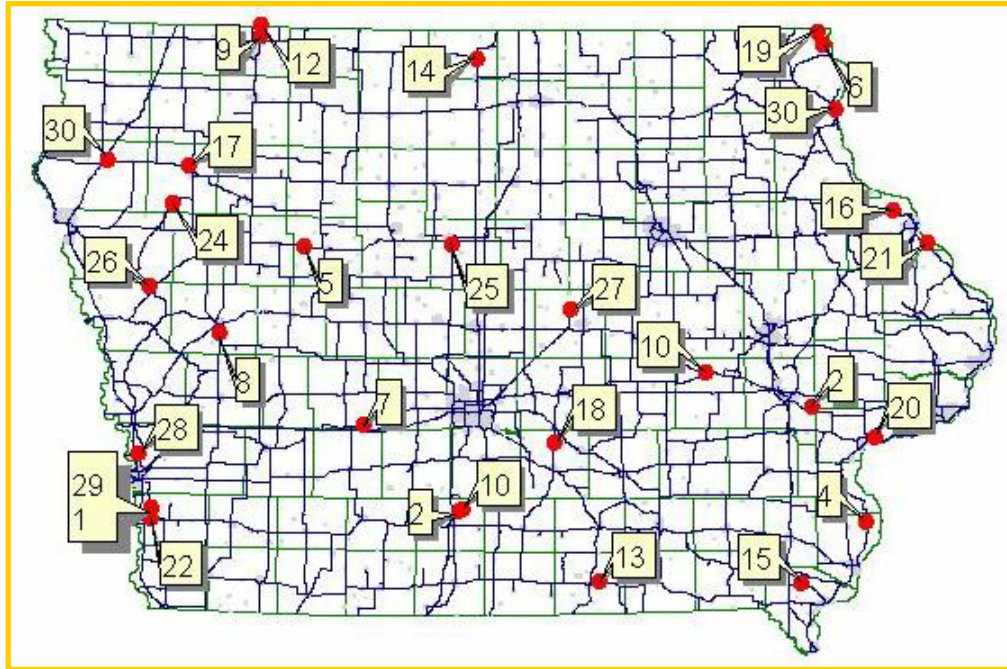


Change in Rank When First Fatality Is Changed to Major Injury

Systematic Identification of High Crash Locations

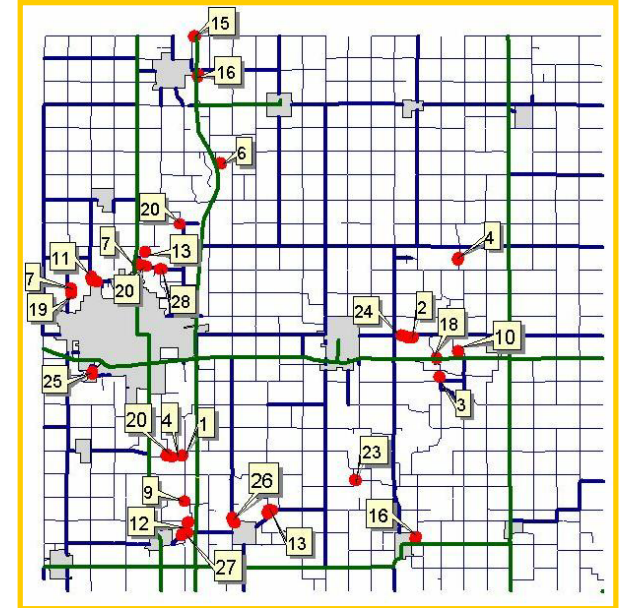


High Crash Curves



Top 30 Average

- 11.5/mvm
- $f=9.5$
- \$490,000 Loss
- 5% of crashes (1% of curves)
- 11% of all fatalities



Statewide Average

- 1.4/mvm
- $f=1.9$
- \$55,000 Loss

Worst

- 27.4/mvm
- $f=14$
- \$960,000 Loss

Curve length and degree of curvature are significant causal variables.

High Crash Curves: Low Cost Mitigation

Improved Signage

BEFORE

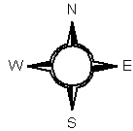


AFTER

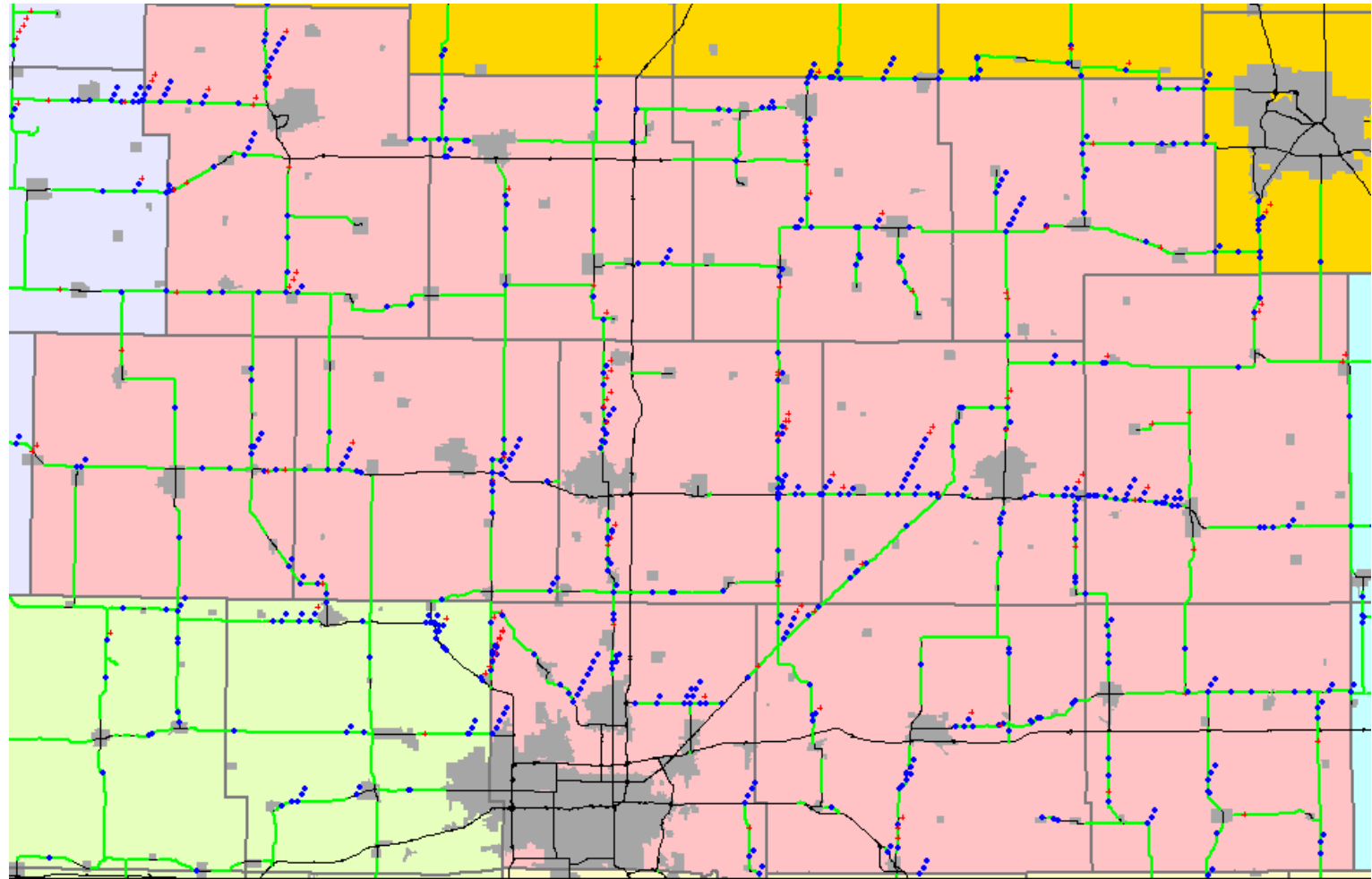


Iowa DOT District 1

Rural Two-Lane Primary Road Fatalities and Major Injuries (1998-2000)



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LEGEND

Injury Severities

- Fatal (106)
- Major Injury (476)
- 2-Lane Rural Primary Roads
- Primary Roads
- County Boundaries
- Corporate Boundaries

IDOT Districts

- 1
- 2
- 3
- 4
- 5
- 6

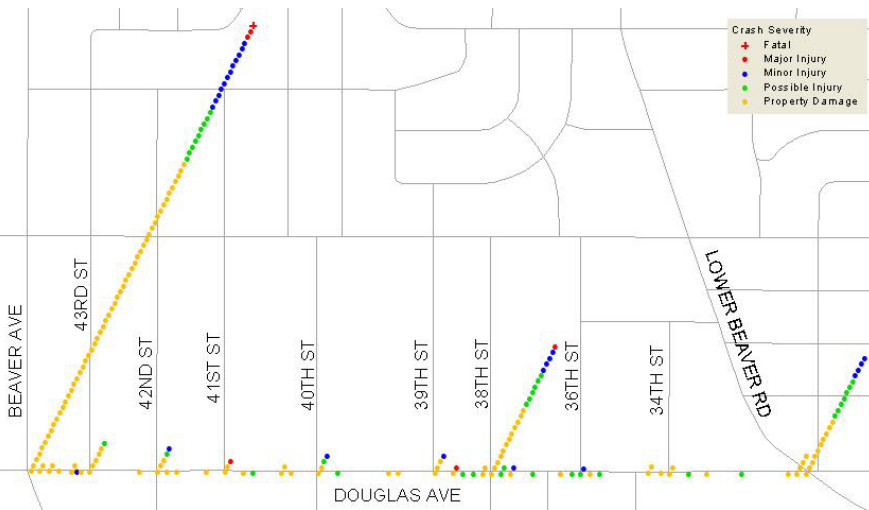
20 unlocated injury severities not represented.
(0 Fatal, 20 Major Injuries)

Disclaimer: The Center for Transportation Research and Education presents these data as preliminary.

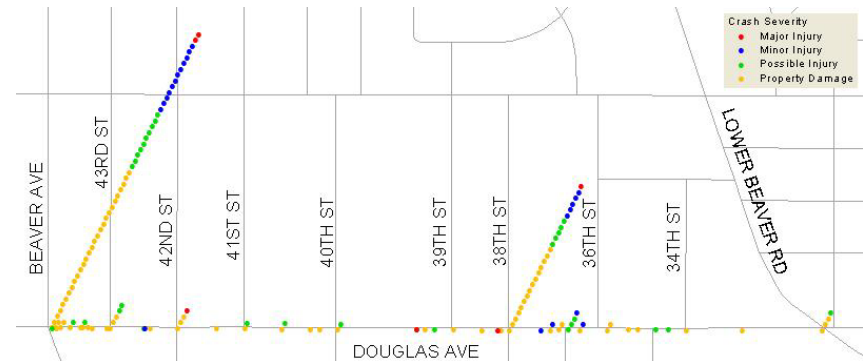
Project & Site Review

- Evaluate the safety-related impact of a project
- Compare facilities of similar types.
- Identify locations with specific problems.

Before



After Widening



1993 - 1995

1993 -1995	COLLISION TYPE													TOTAL CRASHES
	UNKNOWN	HEAD-ON	BROADSIDE/LEFT TURN	REAR END	REAR END/LEFT TURN	SIDESWIPE/SAME DIRECTION	SIDESWIPE/RIGHT TURN	BROADSIDE/RIGHT ANGLE	BROADSIDE/RIGHT ENTERING	HEADON/LEFT ENTERING	SIDESWIPE/BOTH LEFT TURNING	OTHER	SINGLE	
LOCATION														
DOUGLAS AVE & BEAVER AVE	0	1	36	8			1	0		1		3	4	72
DOUGLAS AVE & 43RD ST		1		2				1		1				5
DOUGLAS AVE & 42ND ST				3	1					1				5
DOUGLAS AVE & 41ST ST		1		1										2
DOUGLAS AVE & 40TH ST			1									2		3
DOUGLAS AVE & 39TH ST	1			1								2		4
DOUGLAS AVE & 38TH ST	1		18	2			2							23
DOUGLAS AVE & 37TH ST														0
DOUGLAS AVE & 36TH ST				2										2
DOUGLAS AVE & 35TH ST														0
DOUGLAS AVE & 34TH ST				1									1	2
DOUGLAS AVE & LOWER BEAVER RD	4		8	5			1	1				1		20
MAINLINE	7	1	1	24		2		1	1		1	17	3	58
GRAND TOTAL	22	4	64	49	1	2	2	14	1	3	1	25	8	196

Note: Only crashes occurring within an intersection were assigned to an intersection.

1998 - 2000

1998 - 2000	COLLISION TYPE														TOTAL CRASHES
	UNKNOWN	HEAD-ON	BROADSIDE/LEFT TURN	REAR END	REAR END/RIGHT TURN	REAR END/LEFT TURN	SIDESWIPE/SAME DIRECTION	SIDESWIPE/RIGHT TURN	SIDESWIPE/DUAL RIGHT TURN	BROADSIDE/RIGHT ANGLE	BROADSIDE/LEFT ENTERING	HEADON/LEFT ENTERING	OTHER	SINGLE	
LOCATION															
DOUGLAS AVE & BEAVER AVE	4		16	12						10	2		7	1	52
DOUGLAS AVE & 43RD ST				2		1		1				1			5
DOUGLAS AVE & 42ND ST			1	2						1					4
DOUGLAS AVE & 41ST ST				2											2
DOUGLAS AVE & 40TH ST							1							1	2
DOUGLAS AVE & 39TH ST			1												1
DOUGLAS AVE & 38TH ST	1		15	3						1	1	1	4		26
DOUGLAS AVE & 37TH ST				2		2									4
DOUGLAS AVE & 36TH ST															0
DOUGLAS AVE & 35TH ST						1									1
DOUGLAS AVE & 34TH ST				1											1
DOUGLAS AVE & LOWER BEAVER RD			1	1					1				1		4
MAINLINE	1	1	1	19	1	2	1			3		2	7	5	43
GRAND TOTAL	6	1	35	44	1	6	2	1	1	15	3	4	19	7	145

Note: Only crashes occurring within an intersection were assigned to an intersection.

Iowa-141 Fatalities & Major Injuries (1996-2000)

(Between I-35/I-80 & Iowa-17)

Crash Rate/100 Million VMT:
For the Study area (1996-2000) = 74.41
Statewide Rural Primary (1995-1999) = 122

5-Year Crash Severities (1996-2000)

YEAR	FATAL	NON-FATAL	PDO	TOTAL
1996	0	18	25	43
1997	1	19	25	45
1998	1	15	24	40
1999	0	11	24	35
2000	0	17	22	39
TOTAL	2	80	120	202

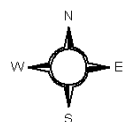
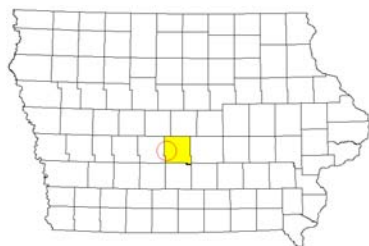
Fatal & Major Injuries by Year

Year	Fatal	Major_inj.	Total
1996	0	5	5
1997	1	3	4
1998	1	5	6
1999	0	0	0
2000	0	0	0
TOTAL	2	13	15

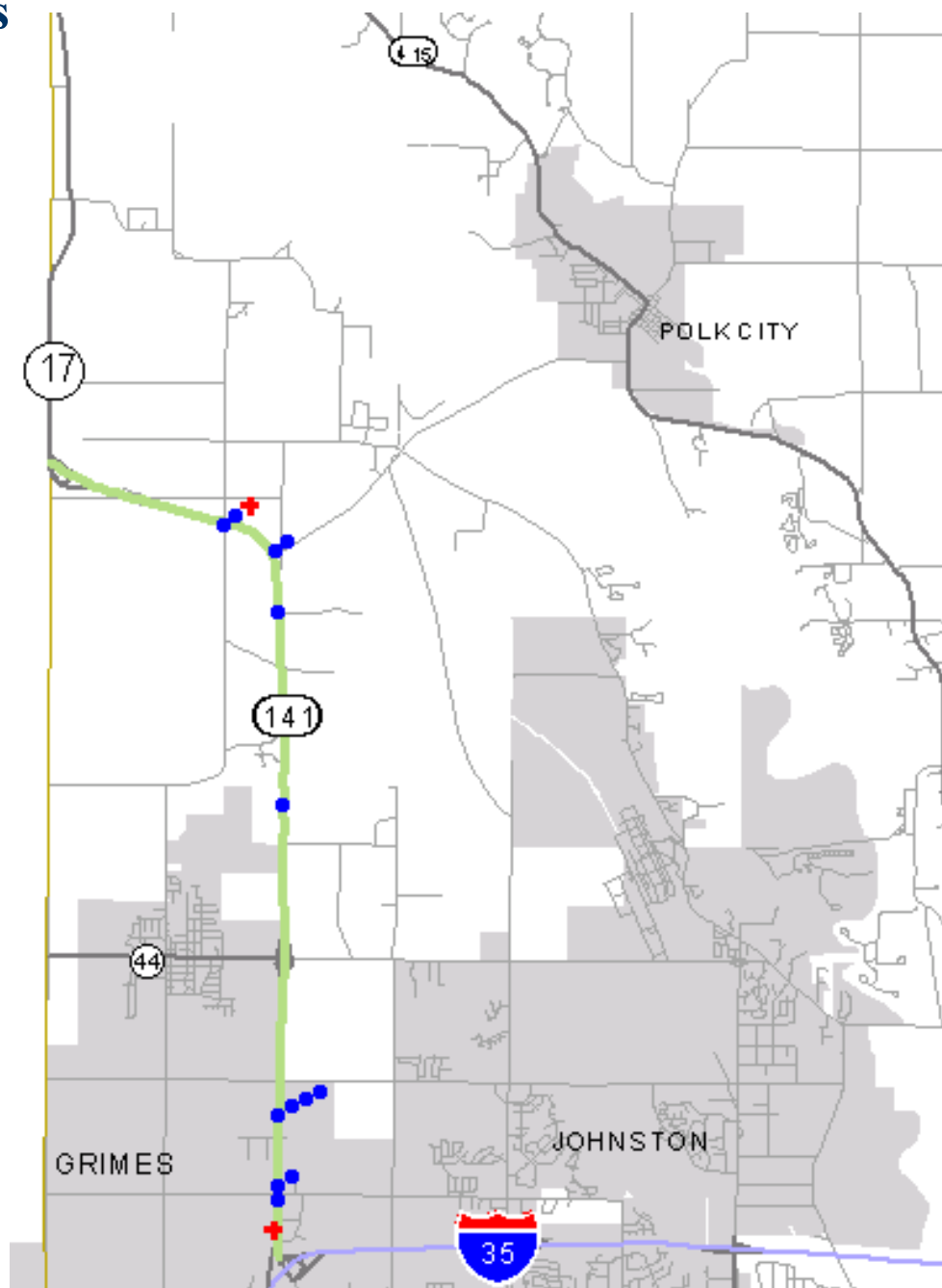
LEGEND

Last 5 Year Injury Severities

- + Fatality (2)
- Major Injury (13)
- Study area
- Interstate Roads
- Primary Roads
- County Boundary
- Corporate Boundaries

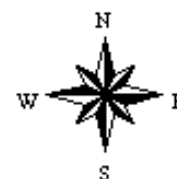
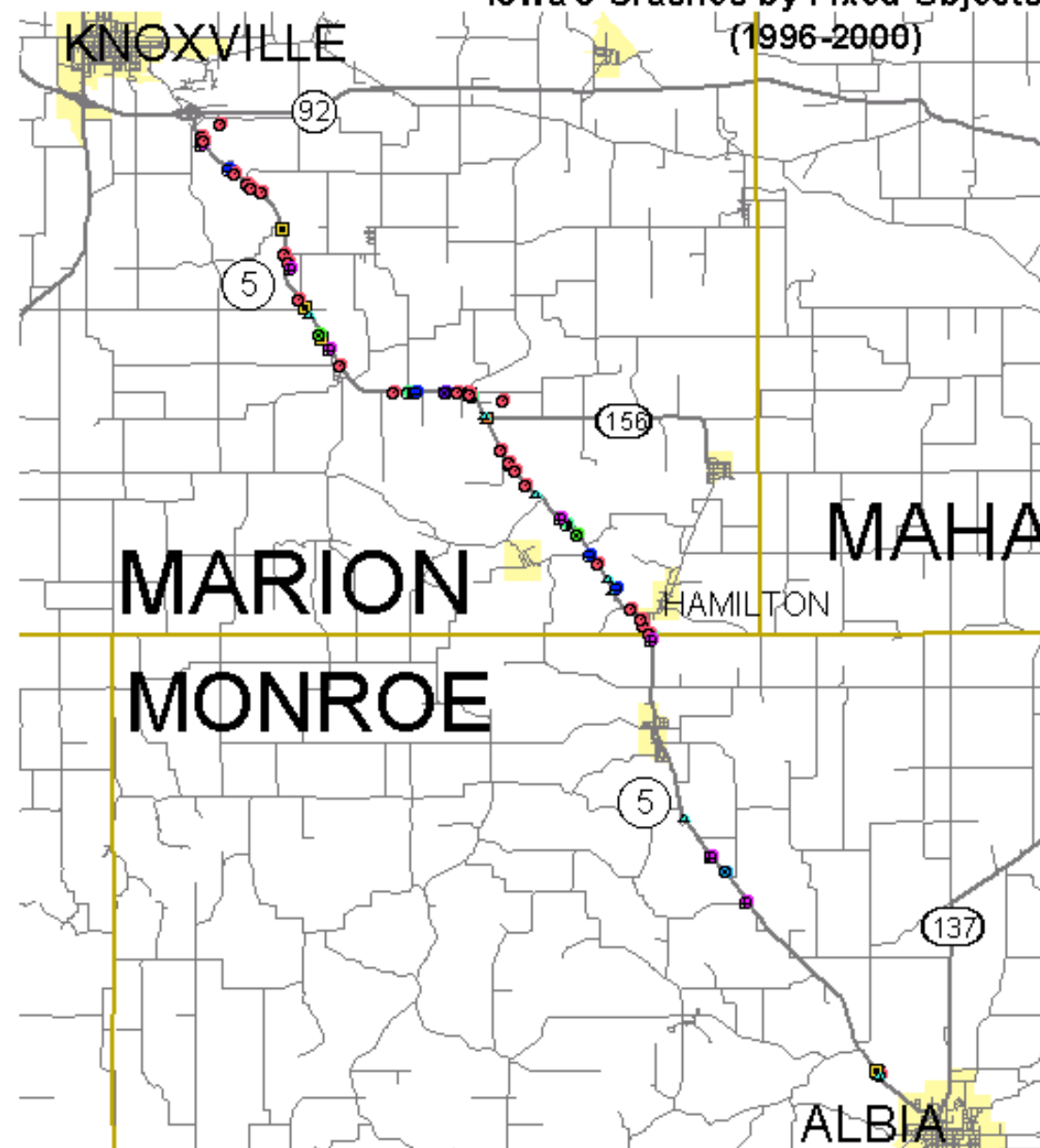


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Iowa 5 Crashes by Fixed Objects Struck (1996-2000)



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Fixed Objects Struck

- Bridge/Overpass (2)
- Ditch (31)
- Embankment/Retaining Wall (2)
- Fence (8)
- Guardrail (1)
- Light Pole (2)
- Sign Post (4)
- Tree/Shrubbery (5)
- Utility Pole (7)
- Other Pole/Support (1)
- Mailbox (1)
- Other (4)

- County boundaries
- ▬ Primary Roads
- ▬ Local Roads
- Corporate boundaries

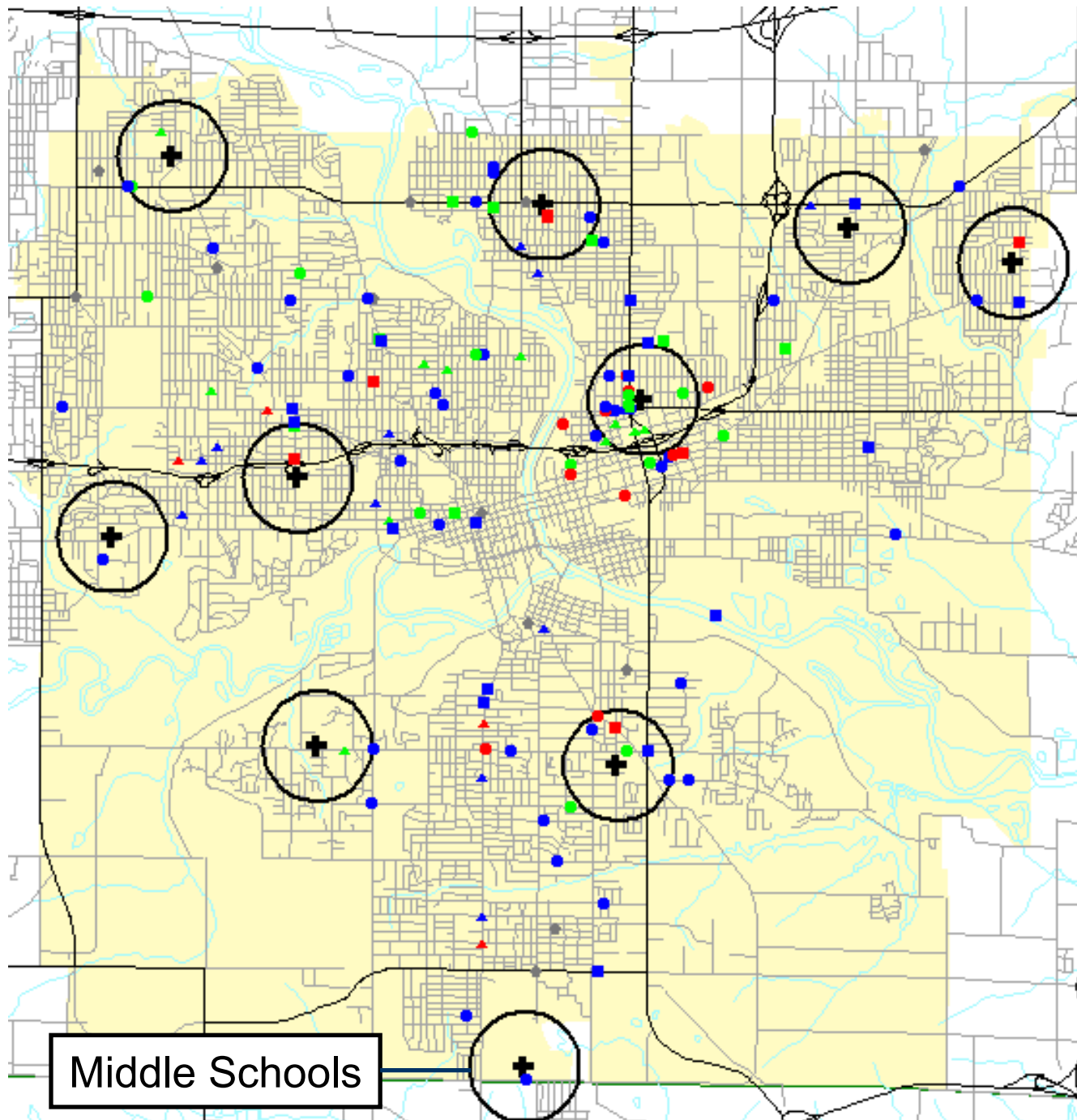
3 0 3 6 9 12 Miles

Disclaimer: The Center for Transportation Research and Education presents these data as preliminary.

School-Age Pedestrian Crashes

City of Des Moines
1995 to 1999
Ages 5 to 19

August 15 to June 15
Monday to Friday
7:00 a.m. to 5:00 p.m.

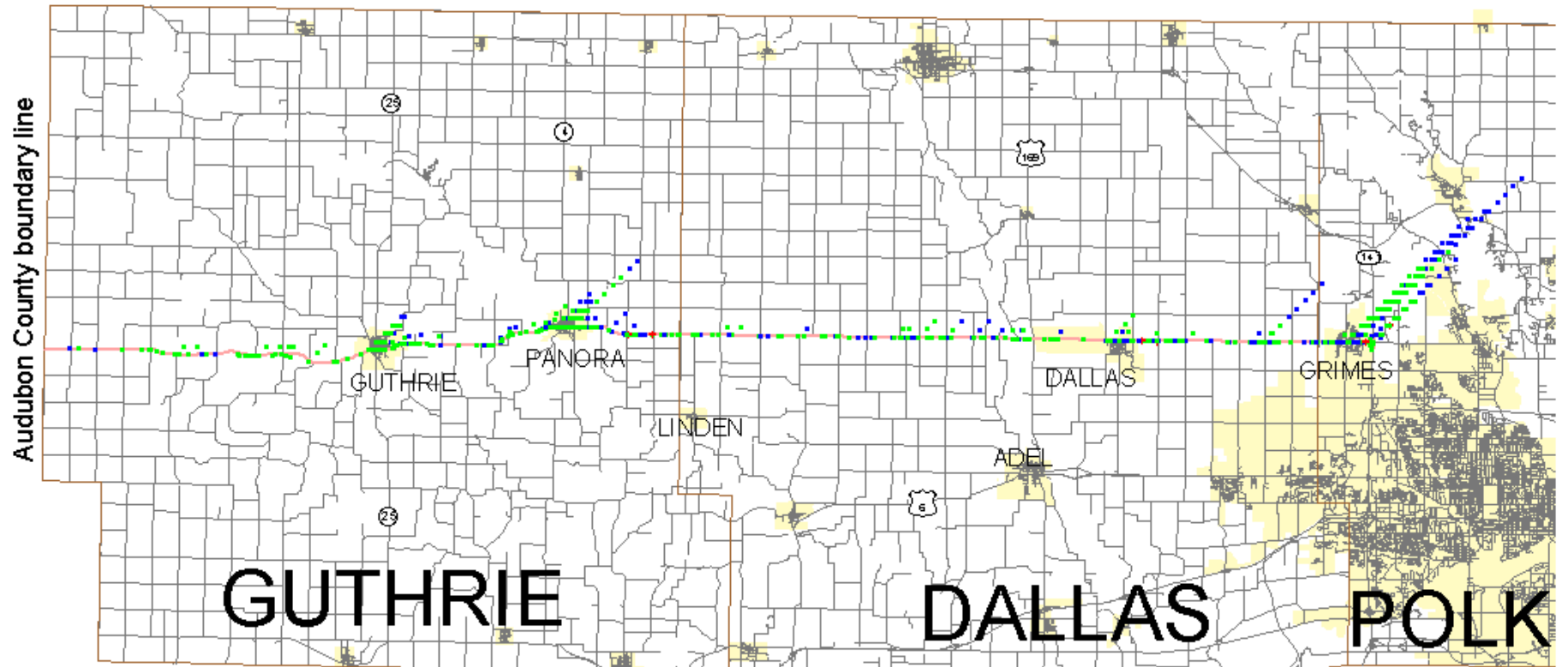


Targeted Enforcement

- Provide law enforcement with corridor crash history to facilitate collaborative enforcement events.
- Provide law enforcement with locations of specific types of crashes to refine enforcement efforts.

Crashes on Iowa-44 (1991-2000)

(From Audubon County Line to Iowa-141)



Note: 38 unlocated crashes not represented.
(9 Non-Fatal, 29 PDO)

3 0 3 6 Miles

LEGEND	
Crash Severity	Primary Roads
• Fatal (6)	County Boundaries
• Non-Fatal (20)	Public Roads
• Property Damage Only (450)	Corporate Boundaries
— Iowa 44	

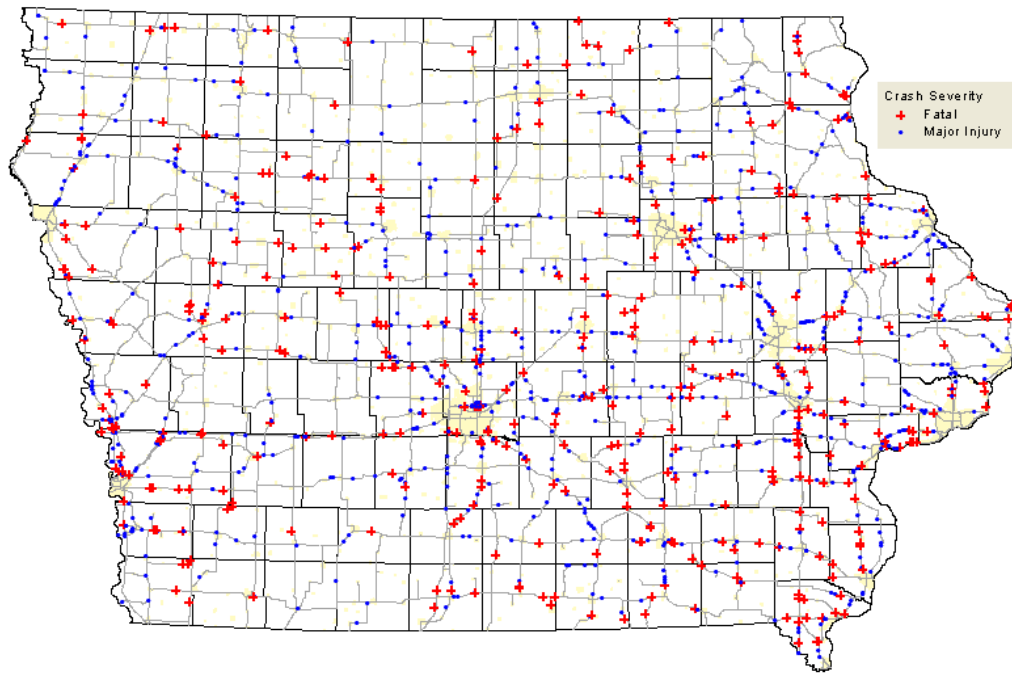


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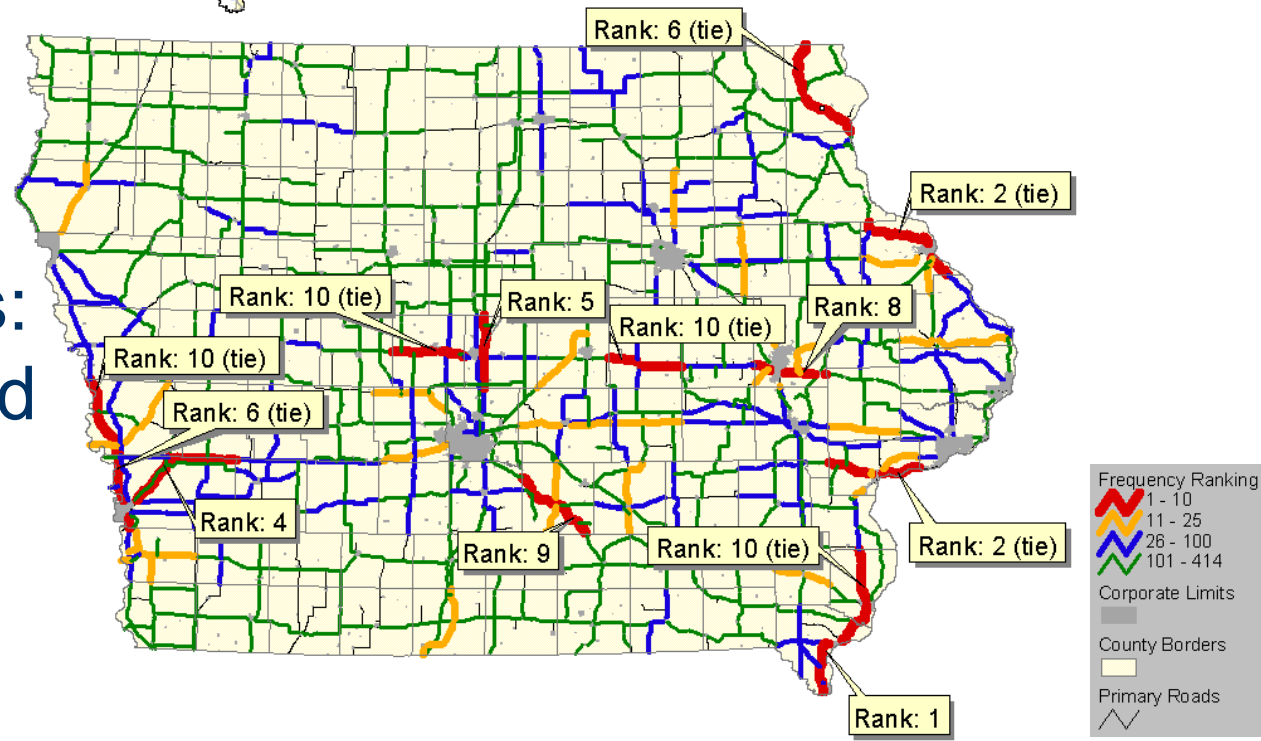
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11/04/2002



Rural Alcohol-Related Fatal and Major Injury Crashes

Rural Alcohol-Related Crashes: Corridors Ranked by Frequency



Other Safety-Related Efforts

- Iowa Traffic Safety Data Service (ITSDS)
 - Funded by GTSB and Iowa DOT
 - Aides agencies in obtaining, mapping, and evaluating crash information.
 - FY02: 63 requests from 23 agencies
- Safety Circuit Rider
 - Provides conferences, workshops, technical advice for traffic safety related topics
 - 2001: 54 workshop presentations with 1500 participants
- Law Enforcement Liaison

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Review

- Traffic safety research begins with the data.
- Key research components are extensive crash and roadway databases, analysis tools and multidisciplinary approach.
- Research activities range from site specific to system wide analyses and may promote end user interpretation.

Questions?

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